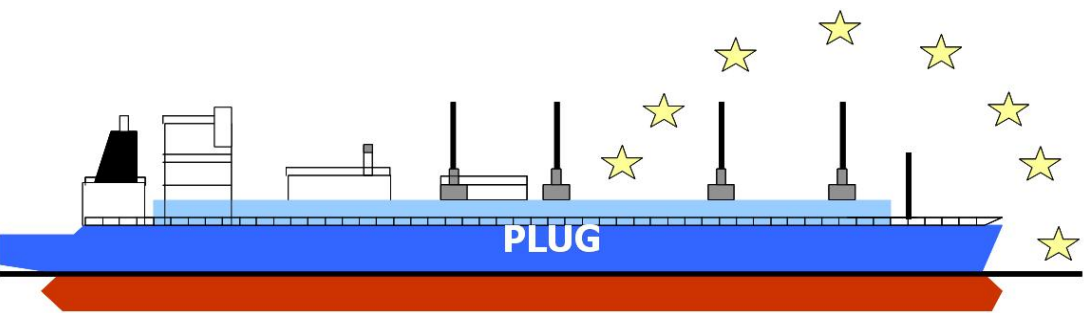
ASSESSMENT OF A BUSINESS MODEL FOR POWER EXCHANGE BETWEEN VESSELS AND ASHORE ELECTRICITY DISTRIBUTION NETWORK

Andrei Z. Morch, SINTEF Energiforskning AS
Damien Féger, Snecma
Nicolai Feilberg, SINTEF Energiforskning AS



Background

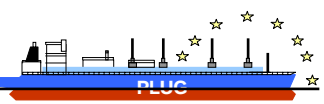
- The international shipping shows a strong interest to supplying of vessels with electricity from the ashore distribution network (so-called “cold ironing”)
- Today’s solutions are not-standardised and have limited transmission capacity
- The connection is very time and labour consuming and does not meet the LNG safety requirements

PLUG

Power Generation During Loading and Unloading (PLUG)

Specific Targeted Research Project (STREP) in the FP6

- The main objective is to develop and put on the market a standard physical power interface between cargo vessels and electricity distribution network at harbour terminals
- The specifications:
  - Establishment of the connection: 15 minutes
  - Safe emergency release in less than 60 seconds
  - 8 MW / 6600 V capability for cold ironing, scalable to up to 25 MW for power generation towards the shore
  - Watertight (20 m) connector when disconnected
  - Seamless transfer between on board and on shore supply

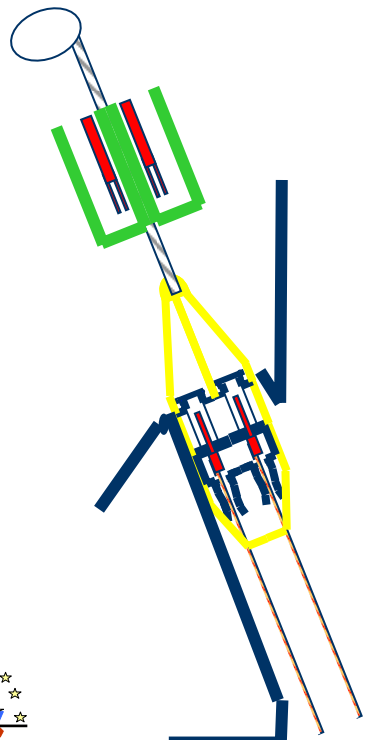


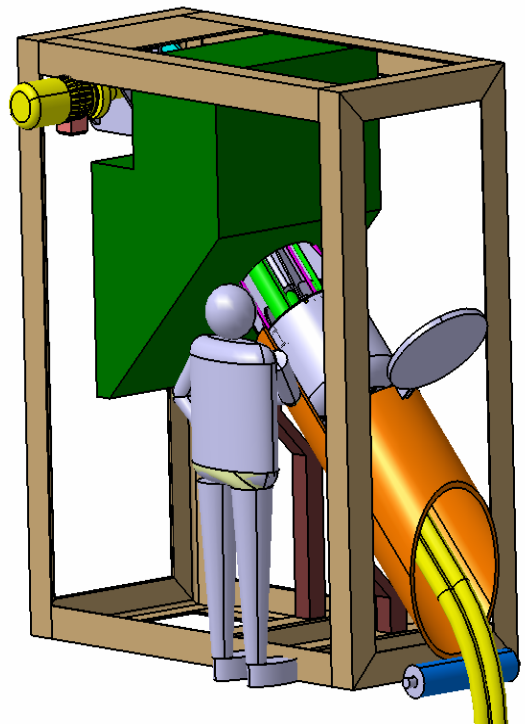
The project partners

Partner	Country	Responsibility in the project
Snecma	France	Project coordinator
Converteam S.A.S	France	Electrical architecture
WAVESPEC Limited	United Kingdom	Crew and terminal operation procedures
SINTEF Energy Research	Norway	Demonstrator “link to the market “
Stäubli SCA	France	High voltage /high power connector
Leduc	France	Demonstration tests

The technical concept

- Use vessel's generators to feed power into the local electricity distribution network
- Use local network to supply the vessel's electricity demand during loading/unloading





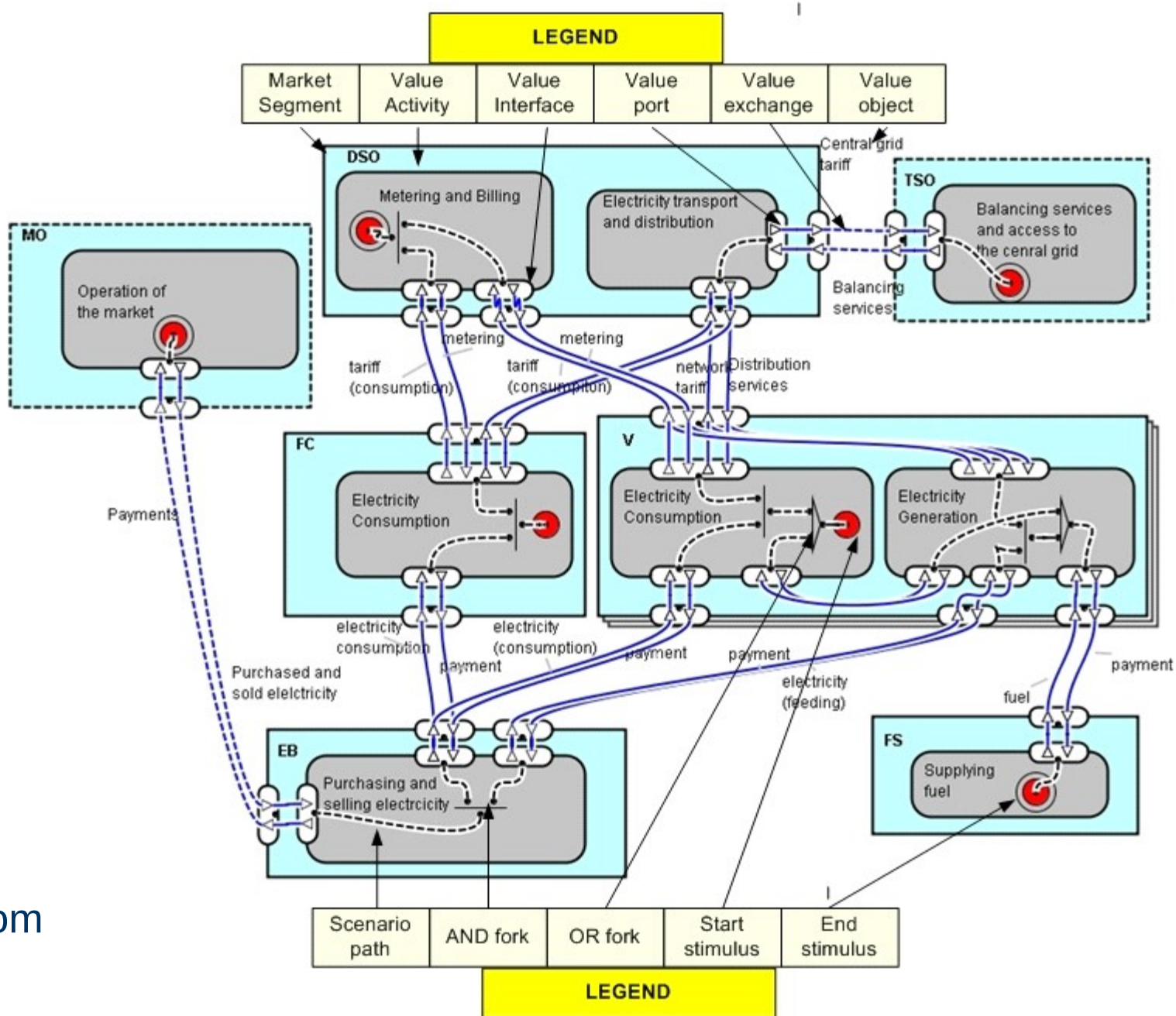
List of assumptions for the development of the Business Model

- None or minimum modifications, to the existing rules, regulations and information exchanging routines are required
- Creation of preferably none or minimum new market actors
- The existing actors will continue to carry out their core functions

Example of power exchange

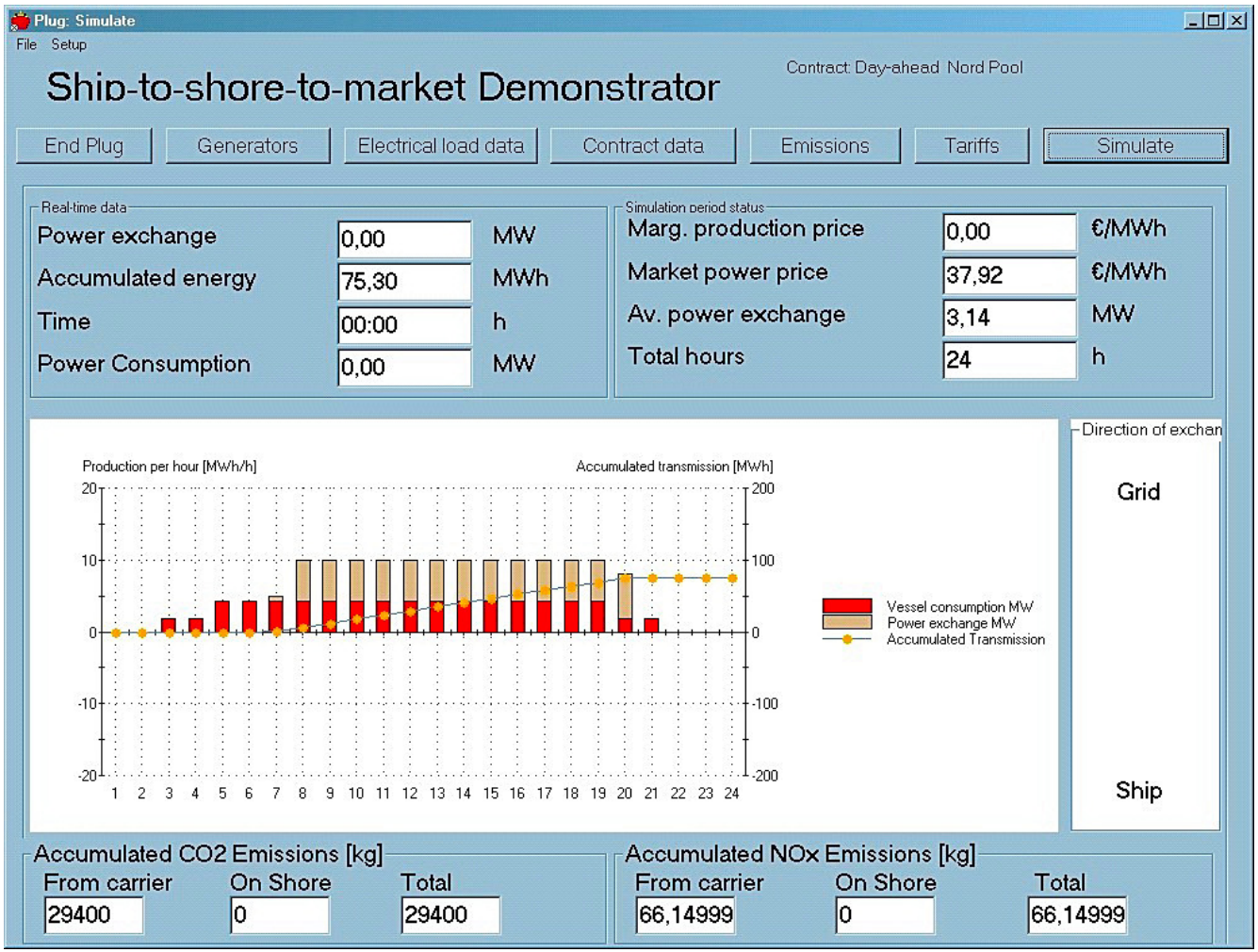
- Refers to Melkøya terminal in the Northern Norway (50-60 shipments pr. year)
- Uses data for LNG carriers, which are planned for operation at Melkøya
- Refers in general to rules, regulation and pricing for Norway

The Business Model (e3value)



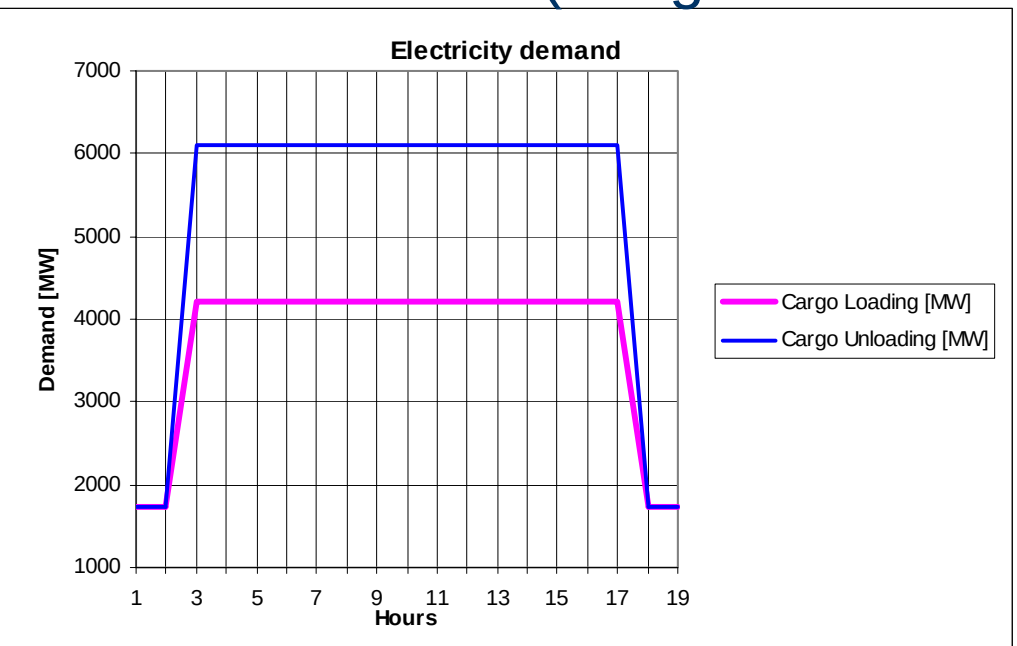
www.e3value.com

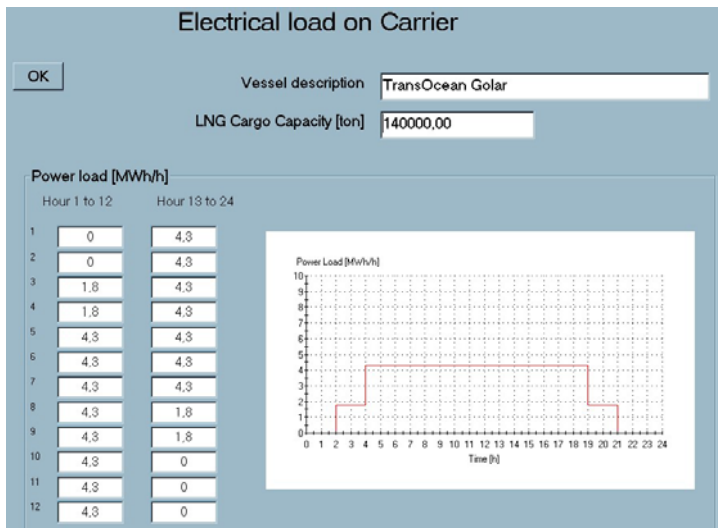
The Demonstrator



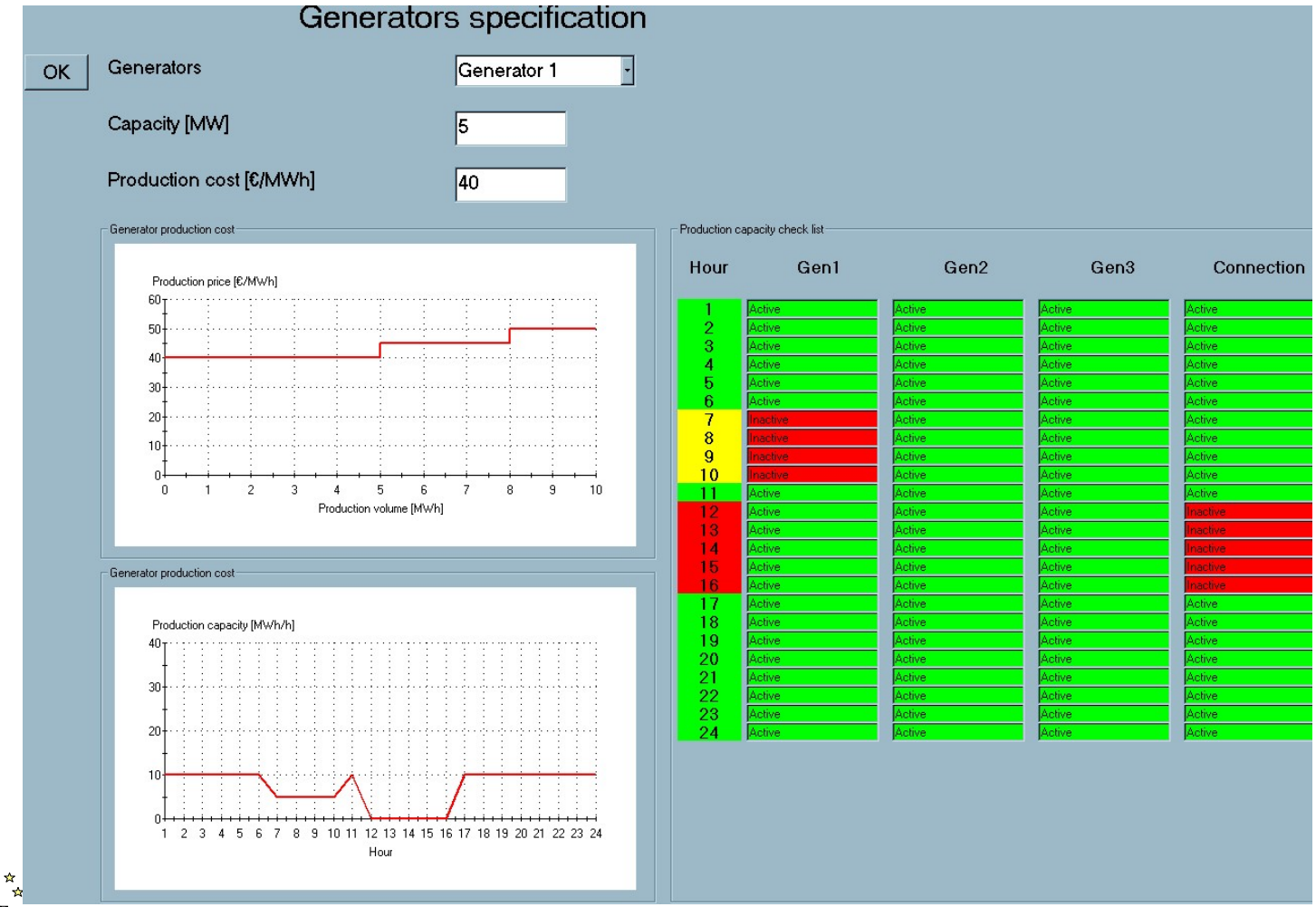
Input data to the simulation

- Generator data (availability, capacity, production costs)
- Electrical Load (own)
- Contract data (prices for 24 hours, direct download or manual)
- Distribution network tariff data
- Emission data (the generation mix onboard and ashore)

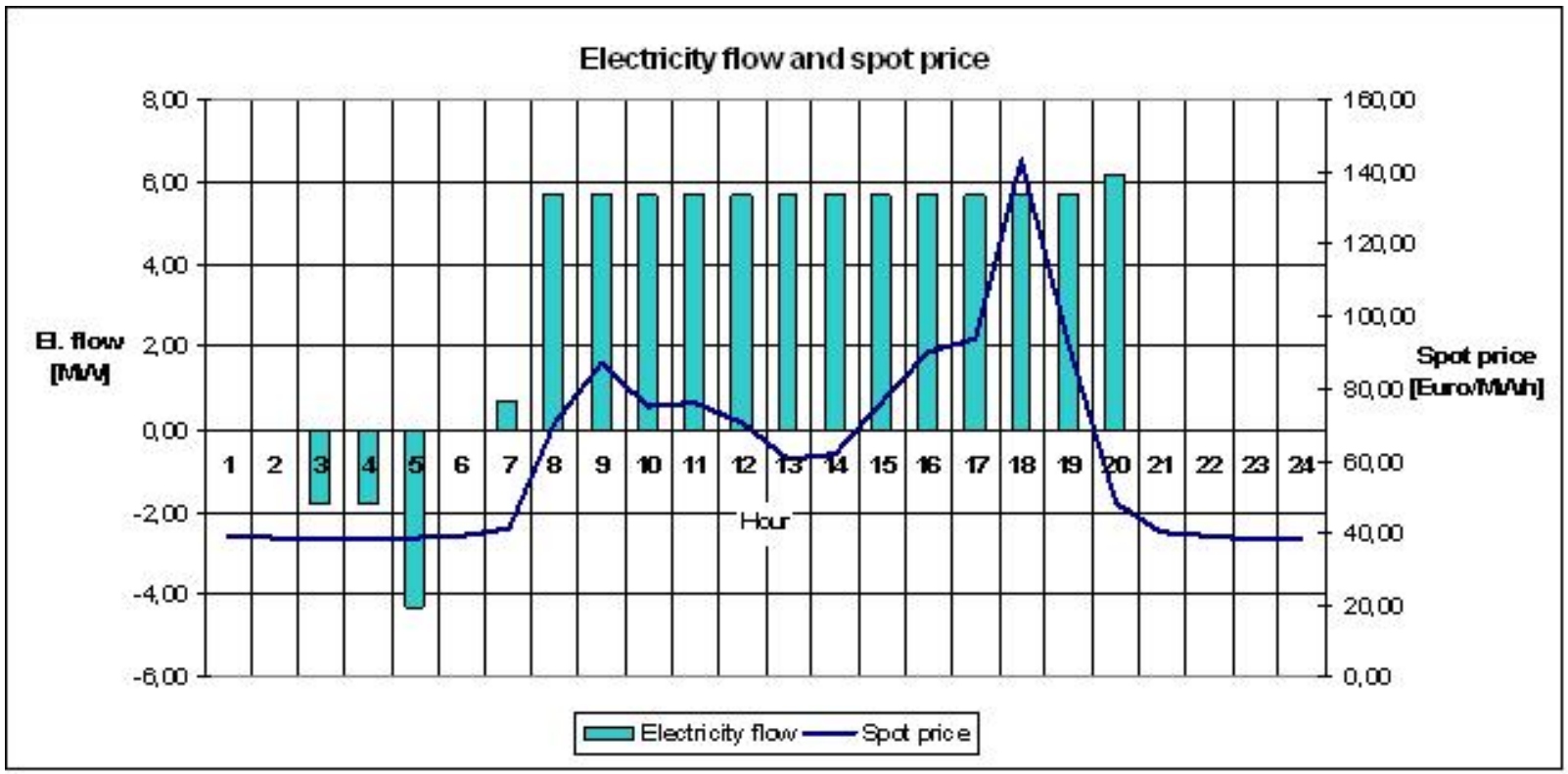




Input data: Generation Specificaiton

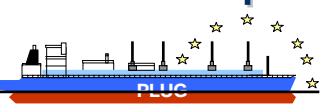


Example of 24-hours simulation



Input data for a one-year long simulation

- Historical electricity prices for Hammerfest in 2006
- 73 calls in the harbour pr year with 19 hours duration
- Historical distribution network tariffs for 2006 (disconnectable consumption and feeding)
- Historic generation costs:
  - 30 Euro/MWh for the generator with 5 MW capacity
  - 35 Euro/MWh for the generator with 3 MW generation capacity
  - 40 Euro/MWh for the generation with 2 MW generation capacity

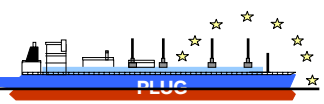


The simulation results

Title	Value
Electricity export from the Vessel to the electricity market ashore	7.703,90 MWh
Electricity import from the electricity market ashore to the Vessel	8,60 MWh
Gross revenues for the electricity export	396.724,83 Euro
Fuel costs for the exported power	270.654,00 Euro
Network tariff costs for feeding and consumption	2.760,86 Euro
Total expected incomes pr year	123.309,97 Euro

Conclusions, limitations and discussion

- Surprising results: it would be fairly profitable to export surplus electricity generation from a vessel to the conventional electricity market ashore
  - Low fuel prices in 2006
  - High distribution network tariffs for the consumption
- Limitations in the present tariff structure
  - The existing capacity charge is simply prohibitively high for this type of consumption
  - Need for a special tariff for a two-way connection
- Uncertainty about the present legislation



The End

www.sintef.no/plug